

REMARKS

The above amendment is made in response to the Office action of April 16, 2002. Applicant has enclosed herewith a copy of the marked-up version of the amended claims as required by 37 C.F.R. §1.121. The Examiner's reconsideration is respectfully requested in view of the above amendment and the following remarks.

Claim 4 has been canceled, without prejudice. Claims 1, 2, 5 and 11 have been amended. Claims 1-3, 5-14 and new claims 15 and 16 are pending in the present application.

Claim 11 stands rejected under 35 U.S.C. §112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. In particular, the Examiner has stated that the specification has not described how the combination of the allowing/blocking valve and the check valve is controlled to make excess ozone flow to ozone remover.

Claim 11 has been amended to recite, *inter alia*, a valve member connected between a main valve and an ozone remover, for allowing ozone to flow from the main valve to the ozone remover when ozone pressure determined by an amount of ozone generated by the ozone generator is equal to or greater than a predetermined value. Amended claim 11 is supported by Applicant's specification which, particularly, discloses an ozone control unit in which a valve member (e.g., valves 344 and 345) is disposed between a main valve (320) and an ozone remover and allows ozone to flow only to the ozone remover when the ozone pressure is equal to or greater than a predetermined value. See the specification, for example, page 4, lines 16-27 and Figure 1.

It is respectfully asserted that one reasonably skilled in the art could make or use the claimed invention without undue experimentation from the disclosures in Applicant's specification coupled with information known in the art at the time the application was filed.

It is axiomatic that a patent need not teach, and preferably omits, what is well known in the art. Accordingly, amended claim 11 is believed to satisfy 35 U.S.C. §112,

first paragraph. Reconsideration and withdrawal of the above rejection are respectfully requested.

Claims 1 and 12-14 stand rejected under 35 U.S.C. §102(a) as being anticipated by Horie (U.S. Patent No. 5,928,428). The Examiner has stated that Horie discloses all elements and means of the claimed invention.

Claim 1 has been amended to recite, *inter alia*, a gas supply portion and an ozone supply portion for supplying reaction gas and ozone, respectively, of which supply is controlled such that a thin film is deposited on a wafer at a thickness of an atomic layer by varying inflow duration of the reaction gas or the ozone.

Horie is directed to an apparatus for forming silicon oxide films on a wafer in manufacturing semiconductor devices. In Horie, oxygen-based gas is provided to a chamber merely to accelerate oxidation of TEOS gas which is deposited in an exhaust vacuum pipe, so as to reduce the amount of particles being deposited on the wafer. See col. 6, lines 9-19. Horie does not teach or suggest anything about a gas supply portion and an ozone supply portion for supplying reaction gas and ozone, respectively, such that a thin film is deposited on a wafer at a thickness of an atomic layer by varying inflow duration of the reaction gas or the ozone, as claimed in amended claim 1.

Accordingly, amended claim 1 is believed to be patentably distinct and non-obvious in view of Horie. Claims 12-14 depend directly or indirectly from independent claim 1, thus include all the limitations of claim 1. It is thus believed that claims 12-14 are allowable due to their dependency on claim 1 which is believed to be allowable for at least the reasons stated. Applicant respectfully requests that the Examiner reconsider his rejections on claims 1 and 12-14 under 35 U.S.C. §102(a).

Claims 2, 3 and 10 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Horie in view of Nozawa et al. (U.S. Patent No. 5,290,381; hereinafter "Nozawa"). The Examiner has stated that Horie in combination with Nozawa discloses all elements and means of the claimed invention.

As mentioned above for claim 1, Horie neither teaches nor suggests a gas supply portion and an ozone supply portion for supplying reaction gas and ozone, respectively, such that a thin film is deposited on a wafer at a thickness of an atomic layer by varying inflow duration of the reaction gas or the ozone, as claimed in amended claim 1.

Nozawa merely discloses a plasma etching apparatus for manufacturing semiconductor devices, which has a cooling mechanism for protecting semiconductor wafers from heat during an etching process. Nozawa does not teach or suggest anything about a gas supply portion and an ozone supply portion for supplying reaction gas and ozone, respectively, such that a thin film is deposited on a wafer at a thickness of an atomic layer by varying inflow duration of the reaction gas or the ozone, as claimed in claim 1.

Thus, Applicant submits that Horie and Nozawa, either alone or in combination, do not render obvious the subject matter of claim 1. Claims 2 and 10 depend directly or indirectly from independent claim 1, thus include all the limitations of claim 1.

Accordingly, it is believed that claims 2 and 10 are allowable due to their dependency on claim 1 which is believed to be allowable for at least the reasons stated. Reconsideration of the rejections on claims 2 and 10 is respectfully requested.

Claims 4 and 5 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Horie in view of Nozawa and further in view of Tanaka (U.S. Patent No. 5,091,207). The Examiner has stated that all elements and means of the claimed invention are disclosed in the cited prior art references. Claim 4 has been canceled without prejudice.

As mentioned above, neither Horie nor Nozawa teaches or suggests a gas supply portion and an ozone supply portion for supplying reaction gas and ozone, respectively, such that a thin film is deposited on a wafer at a thickness of an atomic layer by varying inflow duration of the reaction gas or the ozone, as claimed in amended claim 1.

Tanaka is directed to an apparatus for chemical vapor deposition (CVD) process in manufacturing semiconductor devices. Tanaka merely discloses a CVD apparatus for providing a reaction furnace with a gas flow having improved uniformity. In Tanaka, there is no disclosure or suggestion of anything about a gas supply portion and an ozone supply portion for supplying reaction gas and ozone, respectively, such that a thin film is deposited on a wafer at a thickness of an atomic layer by varying inflow duration of the reaction gas or the ozone, as claimed in amended claim 1.

Thus, Applicant submits that claim 1 is patentably distinct and non-obvious over the cited references. Claim 5 depends indirectly from independent claim 1, thus includes all the limitations of claim 1.

Accordingly, it is believed that claim 5 is allowable due to its dependency on claim 1 which is believed to be allowable for at least the reasons stated. Reconsideration of the rejection on claim 5 is respectfully requested.

Claims 6-9 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Horie in view of Nozawa and further in view of Limb et al. (U.S. Patent No. 5,352,615; hereinafter "Limb"). The Examiner has stated that Horie in combination with Nozawa and Limb discloses all elements and means of the claimed invention.

As mentioned above, neither Horie nor Nozawa teaches or suggests a gas supply portion and an ozone supply portion for supplying reaction gas and ozone, respectively, such that a thin film is deposited on a wafer at a thickness of an atomic layer by varying inflow duration of the reaction gas or the ozone, as claimed in amended claim 1.

Limb is directed to an apparatus for denuding a semiconductor substrate. Limb discloses gas lines for CO, CO₂ and inert gas flow. The CO, CO₂ and inert gas lines in Limb are merely for providing a furnace tube with a "mixture" of CO and CO₂ gases or the inert gas. See col. 2, lines 41-56 and col. 3, lines 9-18. Limb neither discloses nor suggests a gas supply portion and an ozone supply portion for supplying reaction gas and ozone, respectively, such that a thin film is deposited on a wafer at a thickness of an atomic layer by varying inflow duration of the reaction gas or the ozone, as claimed in claim 1.

Accordingly, claim 1 is believed to be patentably distinct and non-obvious in view of Horie, Nozawa and/or Limb. Claims 6-9 depend directly or indirectly from claim 1, thus include all the limitations of claim 1. It is thus believed that claims 6-9 are allowable for at least the reasons given above for the independent claim 1. The Examiner's reconsideration of the rejections on claims 6-9 is respectfully requested.

Claim 11 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Horie in view of Nozawa and further in view of Nishikawa et al. (U.S. Patent No. 5,470,390; hereinafter "Nishikawa"). The Examiner has stated that the cited references disclose all elements and means of claim 11.

As mentioned above, neither Horie nor Nozawa discloses or suggests a gas supply portion and an ozone supply portion for supplying reaction gas and ozone, respectively, such that a thin film is deposited on a wafer at a thickness of an atomic layer by varying inflow duration of the reaction gas or the ozone, as claimed in amended claim 1.

Nishikawa merely discloses an apparatus for supplying a mixture of different gases to a plurality of semiconductor manufacturing units. See col. 2, lines 15-29 and col. 3, lines 62-67. Nishikawa neither teaches nor suggest a gas supply portion and an ozone supply portion for supplying reaction gas and ozone, respectively, such that a thin film is deposited on a wafer at a thickness of an atomic layer by varying inflow duration of the reaction gas or the ozone, as claimed in claim 1.

Thus, it is respectfully submitted that neither Horie, Nozawa, nor Nishikawa, either alone or in combination, discloses or suggests the subject matters, for example the gas supply portion and the ozone supply portion, claimed in amended claim 1.

Claim 11 depends indirectly from claim 1, thus includes all the limitations of claim 1. It is thus believed that claim 11 is allowable for at least the reasons given above for the independent claim 1. The Examiner's reconsideration of the rejection on claim 1 is respectfully requested.

New claims 15 and 16 have been added to further define the present invention.

In view of the foregoing amendments and remarks, it is respectfully submitted that all the claims now pending in the application are in condition for allowance. Early and favorable reconsideration is respectfully requested.

If there are any charges due with respect to this response, please charge them to Deposit Account No. 06-1130 maintained by Applicant's Attorneys.

Respectfully submitted,
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MARKED-UP VERSION OF AMENDMENTS

CLAIM AMENDMENTS

1. (Amended) A semiconductor thin film deposition apparatus comprising:
at least one reactor in which a wafer is received;
a gas supply portion for supplying a reaction gas or inert gas to the reactor, wherein
the gas supply portion includes:

at least one reaction gas supply unit for selectively providing the reaction
gas to the reactor; and

an inert gas supply unit for providing the inert gas to the reactor;

an exhaust pump for exhausting gas from the reactor; and

an ozone supply portion for generating ozone [as a gas that reacts] to react with the
reaction gas, [and for supplying the ozone to the reactor] wherein the ozone supply portion
includes:

an ozone generator for generating the ozone;

at least one ozone transfer unit for transferring ozone to the reactor; and

a selection transfer member for selectively transferring ozone provided from
the at least one ozone transfer unit to the reactor or the exhaust pump,

wherein supply of the reaction gas from the gas supply portion and the ozone from
the ozone supply portion to the reactor is controlled such that a thin film is deposited on
the wafer at a thickness of an atomic layer by varying inflow duration of the reaction gas or
the ozone.

*exhaust pump
switch in add.*

2. (Amended) The semiconductor thin film deposition apparatus of claim 1,
wherein the ozone supply portion comprises:

[an ozone generator;]

a main valve disposed between the ozone generator and the ozone transfer unit, for
[allowing ozone to flow or for blocking the] controlling flow of the ozone;

[at least one ozone transfer unit for transferring ozone, which has passed through
the main valve, to the reactor;] and

an ozone control unit for allowing a certain amount of ozone to flow to the ozone transfer unit [when] by removing an excessive amount of ozone [is] generated by the ozone generator.

5. (Amended) The semiconductor thin film deposition apparatus of claim [4] 3, wherein the selection transfer member comprises:

a first selection valve connected to a line between the process ozone transfer member and the thermal treatment ozone transfer member and the reactor; and

a second selection valve connected to the line and the exhaust pump.

11. (Amended) The semiconductor thin film deposition apparatus of claim 10, wherein the excessive ozone control unit further comprises a valve member [for allowing/blocking the flow of ozone and a check valve for allowing ozone having a predetermined pressure or greater to flow only toward the main valve, the valve and the check valve being installed on the line] connected between the main valve and the ozone remover, for allowing ozone to flow from the main valve to the ozone remover when ozone pressure determined by an amount of ozone generated by the ozone generator is equal to or greater than a predetermined value.